REMARKS

Rejections under 35 USC § 103 based upon Yan in view of Tian

In the Office Action, the Examiner is of the opinion that claims 1, 3 to 11, 14, 15, 17, 20 to 27, 30, 31, 33, 36 and 37 are rendered obvious by the prior art U.S. Patent 6,975,750 to Yan et al (hereinafter 'Yan') in view of U.S. Patent No. 6,879,709 to Tian et al (hereinafter 'Tian').

Claim 1 as amended recites the following:

A face recognition and/or verification method comprising:

registering a persons actual face wherein an image of said actual face is captured and synthesized to create a plurality of face prototypes, said face prototypes representing possible appearances of said actual face under various lighting conditions, varying facial expressions, varying facial orientations, and/or modeling errors, and synthesizing the image of said actual face includes determining alternative facial positions for each eye to create the plurality of face prototypes so as to compensate for possible eye position errors,

wherein said face prototypes are stored for later analysis and comparison with a captured image to be recognised or verified, and wherein at least one of translational, rotational and scalar transformations is applied to the captured actual face image for normalization thereof.

Thus the method of the above referenced claim 1 recites a face recognition and/or verification method wherein a person's actual face is registered. An image of the actual face is captured and synthesized to create a plurality of face prototypes. The face prototypes represent possible appearances of the actual face under various lighting conditions, varying facial expressions, varying facial orientations, and/or modeling errors. Synthesizing of said actual face includes determining alternative positions for each eye to create the plurality of face prototypes so as to compensate for possible errors. The face prototypes are stored for later analysis and comparison with a

captured image to be recognized or verified. At least one of translational, rotational and scalar transformations is applied to the captured actual face image for normalization thereof.

Applicant respectfully submits that pending claim 1 is patentably distinct as well as nonobvious over Yan in view of Tian.

Although Examiner asserts that the minimization problem disclosed in column 9, lines 25 to 35 of Yan discloses a concept of finding probability of errors and that Fig. 9 of Yan discloses the determination of alternative positions for each eye of the claimed invention to create the plurality of face prototypes, Applicant respectfully submits that regardless of Examiner's assertion of any apparent equivalence between particular elements of Applicant's pending claim 1 with respect to Yan and/or Tian, key differences exist between pending claim 1 and any teaching, suggestion, or conclusions or insights that one of ordinary skill in the art could arrive at based upon any disclosure of Yan and Tian.

In particular, Yan discloses that it is necessary to adjust the general model to match the specific human face in accordance with the input human face images to produce a specific 3-D face model. A parameter fitting process is used to accomplish this task (Column 8 lines 63 to 67). To adjust the whole generic human face model automatically when one or several vertices are moved, a deformable face model is adopted (Column 9 lines 1 to 3). One such method to do so is an optimizing mesh technique, in which deformation is finished by some optimizing criterions (Column 9 lines 10 to 13). This method involves the computation of all edge vectors and the number of edge vectors in space mesh which is represented as a minimization problem (Column 9 lines 14 to 35)

Yan further discloses that once a 3-D face model of a specific subject is obtained, realistic individual faces or 2-D face images, at various poses can be synthesized (Column 11 line 65 to column 12 line 1) In contrast, amended claim 1 recites (emphasis added):

"..

said actual face is captured and synthesized *to create a plurality of face prototypes*, said face prototypes representing *possible appearances of said actual face under various lighting conditions, varying facial expressions, varying facial orientations, and/or modeling errors*, and the synthesizing image of said actual face includes determining *alternative facial positions for each eye* to create the plurality of face prototypes so as to *compensate for possible eye position errors*, ..."

Hence with regard to Examiner's assertion that the minimization of Yan discloses a concept of finding probability of errors, Applicant respectfully points out that the minimization problem disclosed in Yan relates to a parameter fitting process used to adjust the general model to match the specific human face and not a concept of finding probability of errors as asserted by Examiner.

Additionally, the approach disclosed in Yan is to adjust the general model to match the specific human face in accordance with the input human face images to produce a specific 3-D face model. In contrast, the claimed invention adopts a significantly different approach by considering possible appearances of said actual face under various lighting conditions, varying facial expressions, varying facial orientations, and/or modeling errors, and by compensating possible errors when the plurality of face prototypes are created.

Hence by the disclosure in Yan (emphasis added) that it is *necessary to adjust* the general model to match the specific human face, it is apparent that the general model is adjusted *to match the specific human face in accordance with the input human face images* to produce a specific 3-D face model. Therefore it can be readily

appreciated that Yan does not contemplate any eventuality or possibility of errors during the capture of the image of the actual face.

Therefore a person of ordinary skill in the art, in assimilating Yan, would in fact had been led away from error modeling (i.e., modeling errors that can affect possible appearances of said actual face under various lighting conditions, varying facial expressions, varying facial orientations, and/or modeling errors, and compensation of possible errors) when the plurality of face prototypes are created, as recited in amended claim 1.

Moreover, Yan discloses adjusting the *whole* generic human face model automatically when one or several vertices are moved, using an optimizing mesh technique involving the computation of all edge vectors and the number of edge vectors in space mesh, which is represented as a minimization problem. Hence, it is readily appreciated that the formulation of the minimization problem in Yan represents the displacement of vertices and length change of the edges generated for the mesh model of the face.

In contrast, amended claim 1 recites:

"…………………………………………

synthesizing the image of said actual face includes determining alternative facial positions for each eye to create the plurality of face prototypes so as to compensate for possible eye position errors, …………………………"

Hence, the claimed invention involves the modeling of localization error related to possible erroneous eye positions.

Applicant respectfully reiterates that the minimization problem in Yan represents the displacement of vertices and length change of the edges generated for the mesh model of the face. Hence the modeling of localization error related to possible erroneous eye positions as claimed in the claimed invention is nowhere contemplated or suggested in Yan.

Furthermore, Applicant respectfully disagrees with Examiner that Fig. 9 of Yan discloses the determination of alternative positions for each eye to create the plurality of face prototypes. More specifically, Fig. 9 of Yan has nothing whatsoever to do with any possible eye position errors. No pose or combination of poses shown or described in relation to Yan's Fig. 9 accounts for any erroneous eye positioning. Each and every pose of Yan has an identical positioning of eyes on the facial image. If an individual seen from a frontal view turns their head and is seen from a perspective view, does the position of their eyes relative to other facial structures change? Applicant respectfully submits that it is certainly not so. Instead, each of Yan's poses maintains the same eye position on the face relative to other facial structures/ the structure of the face itself, and none of the poses of Fig. 9 considers different eye positions on the face itself based on possible eye position errors. Yan's Fig. 9 is not equivalent or suggestive of Applicant's Fig. 2

Particularly, it is disclosed in Yan that realistic individual faces or 2-D face images, at various poses can be synthesized *after* a 3-D face model of a specific subject is obtained and the 3-D face model is produced *from* the input human face images of a specific human face (emphasis added).

In contrast, amended claim 1 recites:

"..

said actual face is *captured and synthesized to create* a plurality of face prototypes,..

synthesizing the image of said actual face includes determining alternative facial positions for each eye to create the plurality of face prototypes so as to compensate for possible eye position errors, ..."

Applicant respectfully submits that the claimed invention synthesizes the image of the actual face to create a plurality of face prototypes, whereas Yan discloses a technique wherein the 3-D face model is synthesized instead.

Furthermore Applicant respectfully points out that the 3-D face model in Yan is produced from the captured face images of a specific human face and that the various poses are derived from the 3-D face model. Yan does not contemplate modeling of errors when the image of the actual face is captured. Instead, Yan discloses a technique in which arbitrary poses are produced from the 3-D face model without considering whether the captured face images forming the 3-D face model may have any errors. Compensation of possible errors during the capturing and synthesizing of the actual face is nowhere contemplated and/or suggested by Yan.

Applicant respectfully submits that if the captured images used to form Yan's 3-D face model were captured erroneously, the 3-D face model would be formed based on the erroneous captured images. Any arbitrary poses derived from the 3-D face model would consequently be erroneous. As a result, the error occurred during the capture of the images to form the 3-D face model may compound/proliferate any potential errors occurring in the arbitrary poses formed from the 3-D face model.

In contrast, by determining alternative positions for each eye to create the plurality of face prototypes so as to compensate for possible errors during the synthesizing of the actual face, as claimed in the claimed invention, proliferation of any potential errors is mitigated.

Applicant further submits that Tian discloses a system and method for automatic detection of neutral expressionless faces in digital images and video. A face is detected and its facial features are normalized to a standard size face in canonical position. Therefore Tian does not disclose error modeling (i.e., possible appearances of said actual face under various lighting conditions, varying facial expressions, varying facial orientations, and/or modeling errors, and compensation of possible errors) in relation to the plurality of face prototypes that are created, as recited in amended claim 1.

No combination of Yan and Tian results in, suggests, or offers one of any skill in the art any insight whatsoever that would lead to the invention of claim 1 as amended.

Remarks made above in relation to claim 1 as amended analogously apply to claims 20 and 37.

Applicant further submits that claims 10 and 26, which are dependent on amended claims 1 and 20 respectively, as amended, further distinguishes the claimed invention from any teaching or suggestion of Yan, Tian or the combination thereof.

Particularly, Applicant respectfully reiterates that compensation of possible errors during the capturing and synthesizing of the actual face is nowhere contemplated and/or suggested by Yan and/or Tian. Each of Yan's poses maintains the same eye position on the face relative to other facial structures and none of the poses of Fig. 9 considers different eye positions on the face itself based on possible eye position errors.

In contrast, each of amended claims 10 and 26 recites (emphasis added):

"…………………………………….

determining alternative facial positions for each eye to create the plurality of face prototypes comprises *producing cropped images* of the synthesized image of the said actual face, *based upon the determined alternative facial positions for each eye.*"

Applicant respectfully submits that it has been earlier established that none of the Yan's poses of Fig. 9 considers different eye positions on the face itself based on possible eye position errors and that Yan's poses in Fig. 9 are derived from the 3-D face model. Hence, none of Yan's poses of Fig. 9 are cropped images produced in the manner recited in each of amended claims 10 and 26.

Accordingly, with regard to Examiner's rejections under 35 U.S.C. §103(a) of claims 1, 20 and 37, Applicant submits that these rejections are consequently disposed of and claims 1, 20 and 37 are in condition for allowance. Applicant submits that other 35 U.S.C. §103(a) rejections for dependent claims 3 to 11, 14, 15, 17, 21 to 27, 30, 31, 33, 36 are consequently disposed of and therefore such dependent claims are in condition for allowance.

From the foregoing remarks, Applicant respectfully requests withdrawal of Examiner's rejections under 35 U.S.C. § 103(a).

Rejections under 35 USC § 103 based upon Yan in view of Tian and further in view of Geng

In the Office Action, the Examiner is also of the opinion that claims 12, 13,16, 19, 28, 29, 32 and 35 are not patentable over Yan in view of Tian and further in view of U.S. Patent No. 7,221,809 to Geng (hereinafter 'Geng') .

Geng discloses a method and system to compare an acquired subject image to a database that stores two dimensional images of faces with multiple possible viewing perspectives, different expressions and lighting conditions. The two dimensional face images are produced digitally from a single three dimensional image of each face.

Geng does not disclose error modeling (i.e., possible appearances of said actual face under various lighting conditions, varying facial expressions, varying facial orientations, and/or modeling errors, and compensation of possible errors) in relation to the plurality of face prototypes that are created, as recited in each of independent claims 1, 20 and 37.

Applicant respectfully submits that the claimed invention as recited in amended independent claims 1, 20 and 37 is not disclosed by any portion of Yan, Tian and/or Geng. Application notes that the inclusion of Geng with Yan and/or Tian fails to give rise to face recognition and/or verification method involving error modeling in the manner recited by amended claim 1.

No combination of Yan, Tian, and Geng results in or leads to the invention of amended claims 1, 20, and 37. Hence, the invention as recited in amended claims 1, 20 and 37 would not have been available or obvious to a person skilled in the art at the time of the claimed invention's filing date.

Applicant respectfully submits that Examiner's rejections of the respective dependent claims in relation to Geng are rendered moot.

Rejections under 35 USC § 103 based upon Yan in view of Tian and further in view of DeCarlo

In the Office Action, the Examiner is also of the opinion that claims 18 and 34 are not patentable over Yan in view of Tian and further in view of DeCarlo et al. (hereinafter 'DeCarlo') .

DeCarlo discloses a method for incorporating optical flow constraint information into a deformable model framework. The model framework is applied in the shape and motion estimation of the human face.

DeCarlo does not disclose error modeling (i.e., possible appearances of said actual face under various lighting conditions, varying facial expressions, varying facial orientations, and/or modeling errors, and compensation of possible errors) in relation to the plurality of face prototypes that are created, as recited in each of independent claims 1, 20 and 37.

Applicant respectfully submits that the claimed invention as recited in amended independent claims 1, 20 and 37 is not disclosed by any portion of Yan, Tian and/or DeCarlo. Application notes that the inclusion of DeCarlo with Yan and/or Tian fails to give rise to face recognition and/or verification method involving error modeling in the manner recited by amended claim 1.

No combination of Yan, Tian, and DeCarlo results in or leads to the invention of amended claims 1, 20, and 37. Hence, the invention as recited in amended claims 1, 20 and 37 would not have been available or obvious to a person skilled in the art at the time of the claimed invention's filing date.

Applicant respectfully submits that Examiner's rejections of the respective dependent claims in relation to DeCarlo are rendered moot.

CONCLUSION

In accordance with the foregoing remarks, Applicant requests withdrawal of rejections of pending claims 1 to 37 under 35 U.S.C. § 103(a). Examiner reconsideration and issuance of a Notice of Allowance are hereby respectfully requested.

Applicants respectfully request reconsideration and that a timely Notice of Allowance be issued in this case.   Applicants believe a three-month extension of time is needed and thus request the time extension.   Please charge to Conley Rose, P.C.'s Deposit Account Number 03-2769/2085-02800 for all necessary fees.

Respectfully submitted,

/Jonathan M. Harris/

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Jonathan M. Harris
PTO Reg. No. 44,144
CONLEY ROSE, P.C.
(713) 238-8000 (Phone)
(713) 238-8008 (Fax)
ATTORNEY FOR APPLICANTS